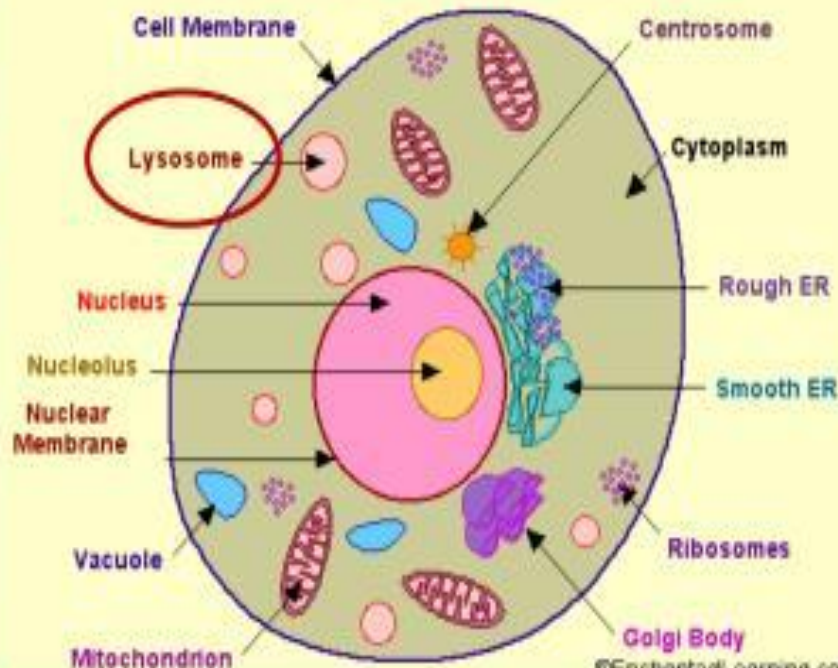


# Plant Developmental Biology

# Plant Structure vs Animal Structure

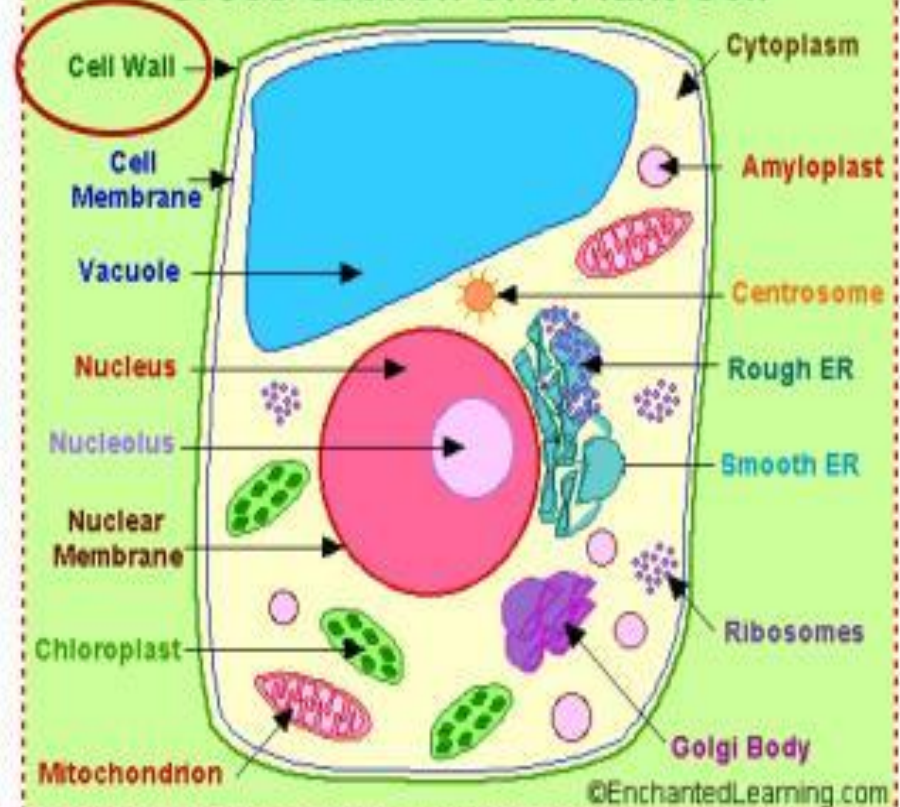
## Animal Structure

### Cross-Section of an Animal Cell



## Plant Structure

### Cross-Section of a Plant Cell

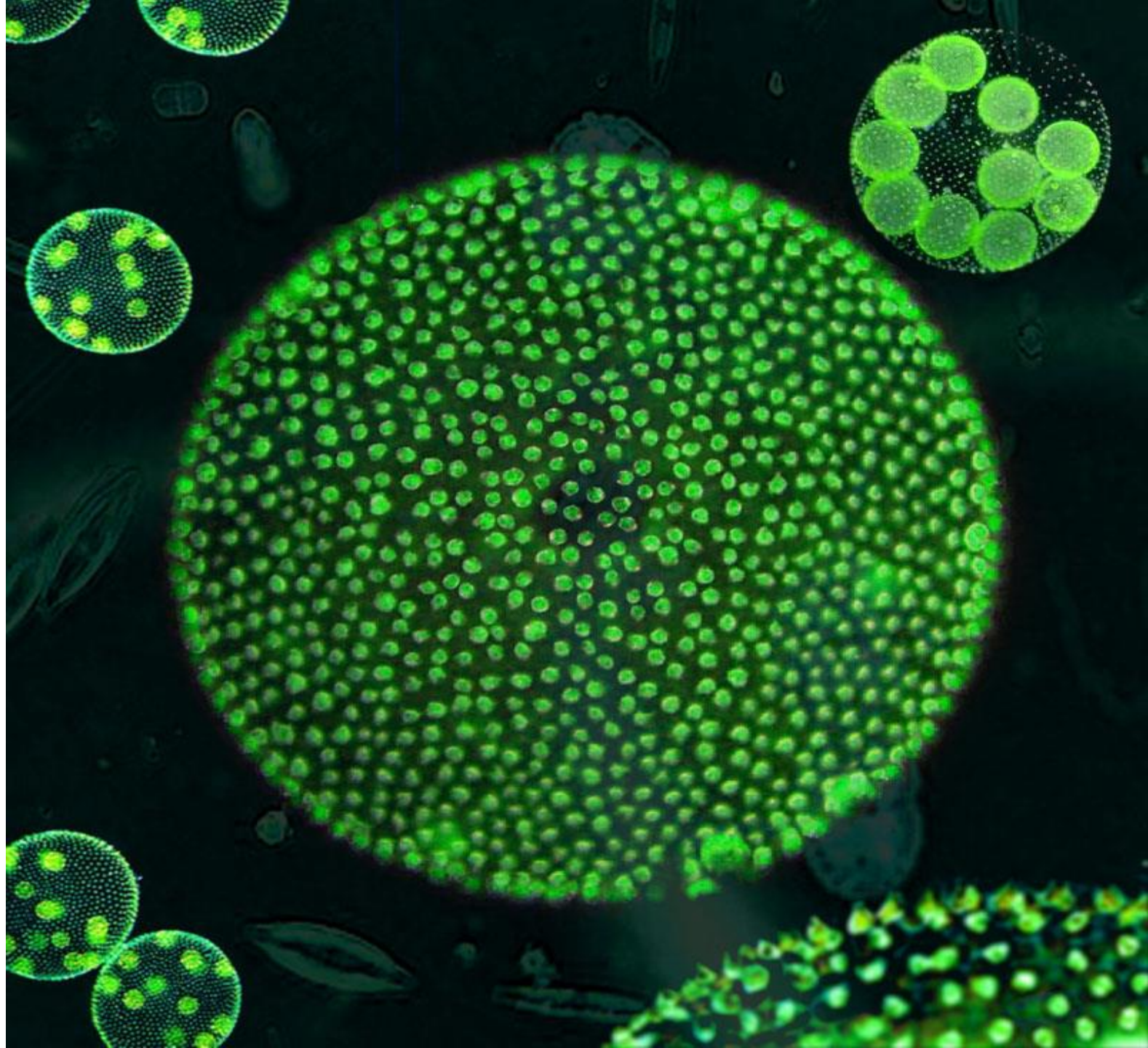


# Multicellularity evolved in plants and animals

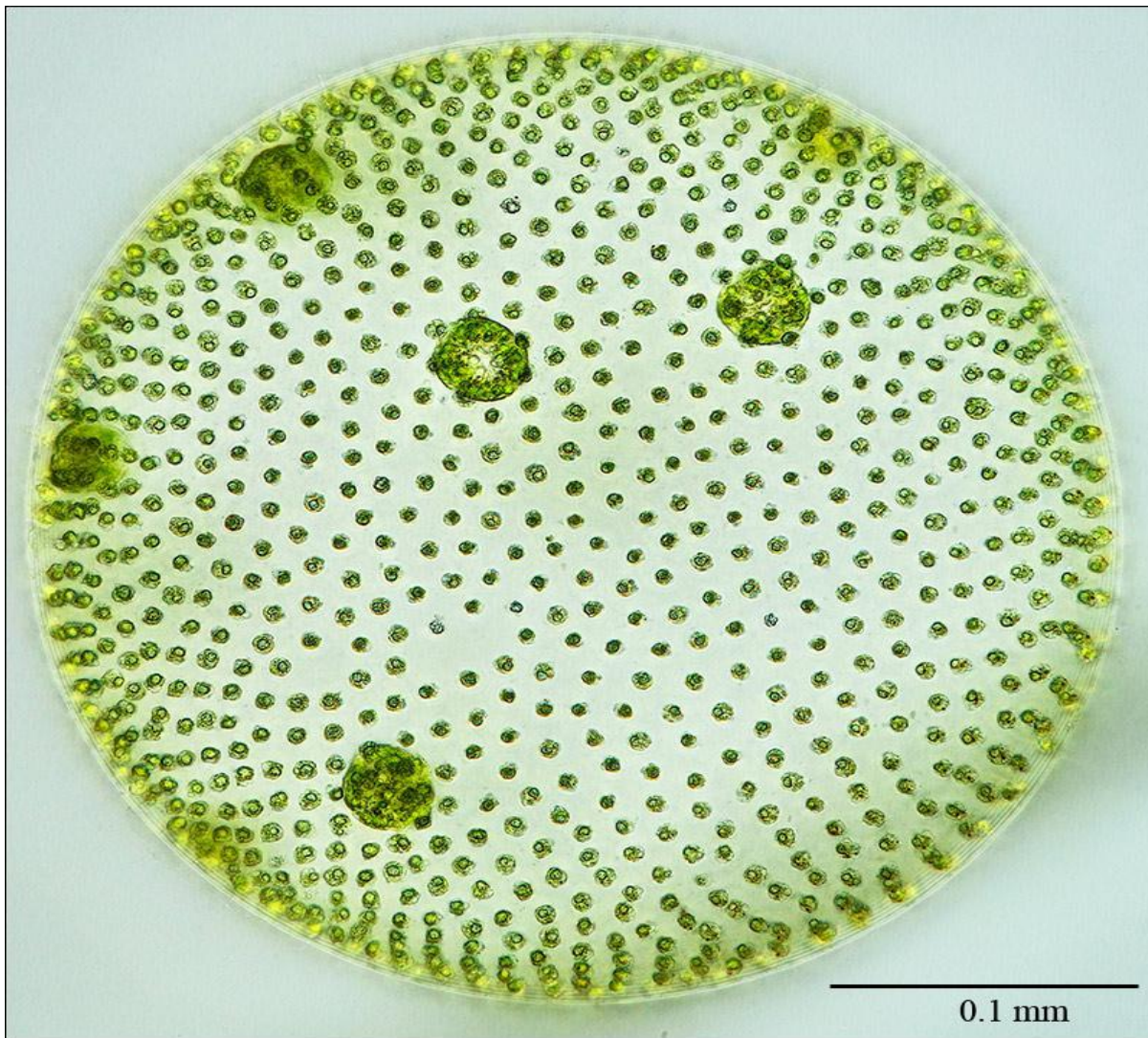
Multicellular organisms are not simply collection of identical cells, they are differentiated to form different cellular types such as xylem , phloem or guard cells performing different functions.

The last common ancestor of plants and animals are unicellular. Even though plants and animals evolved independently, **similar mechanism of intercellular communication evolved in both kingdoms**. Plant cells are connected by **plasmodesmata** whereas animal cells are connected by **gap junctions**. They have similar function although they are different in structure.

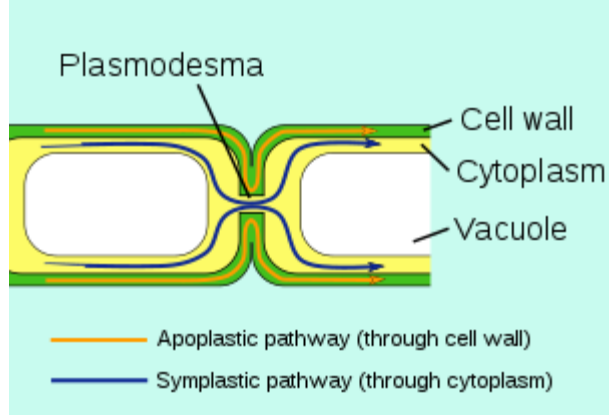




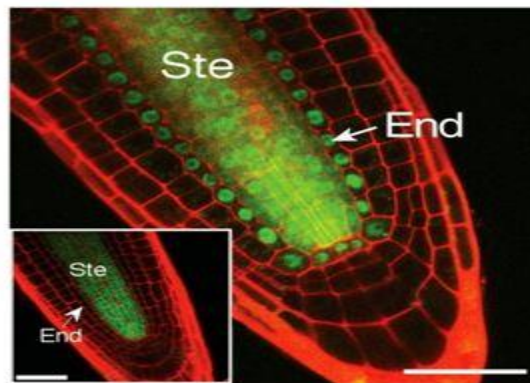
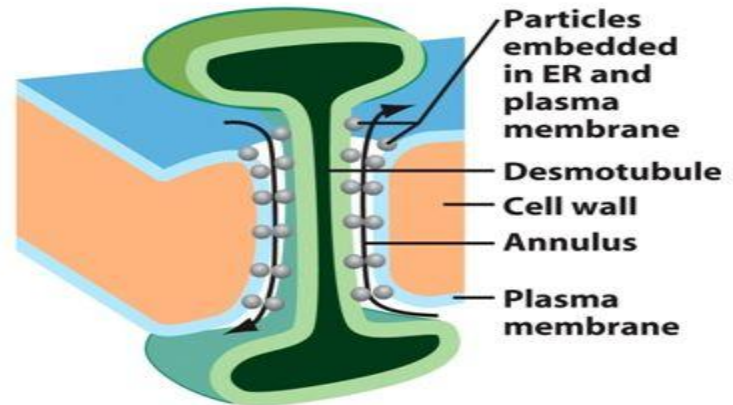
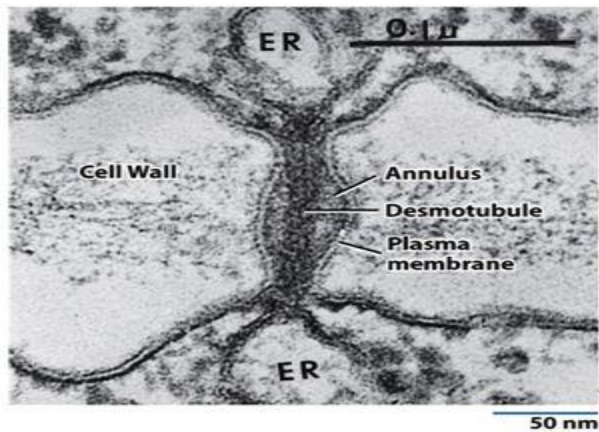




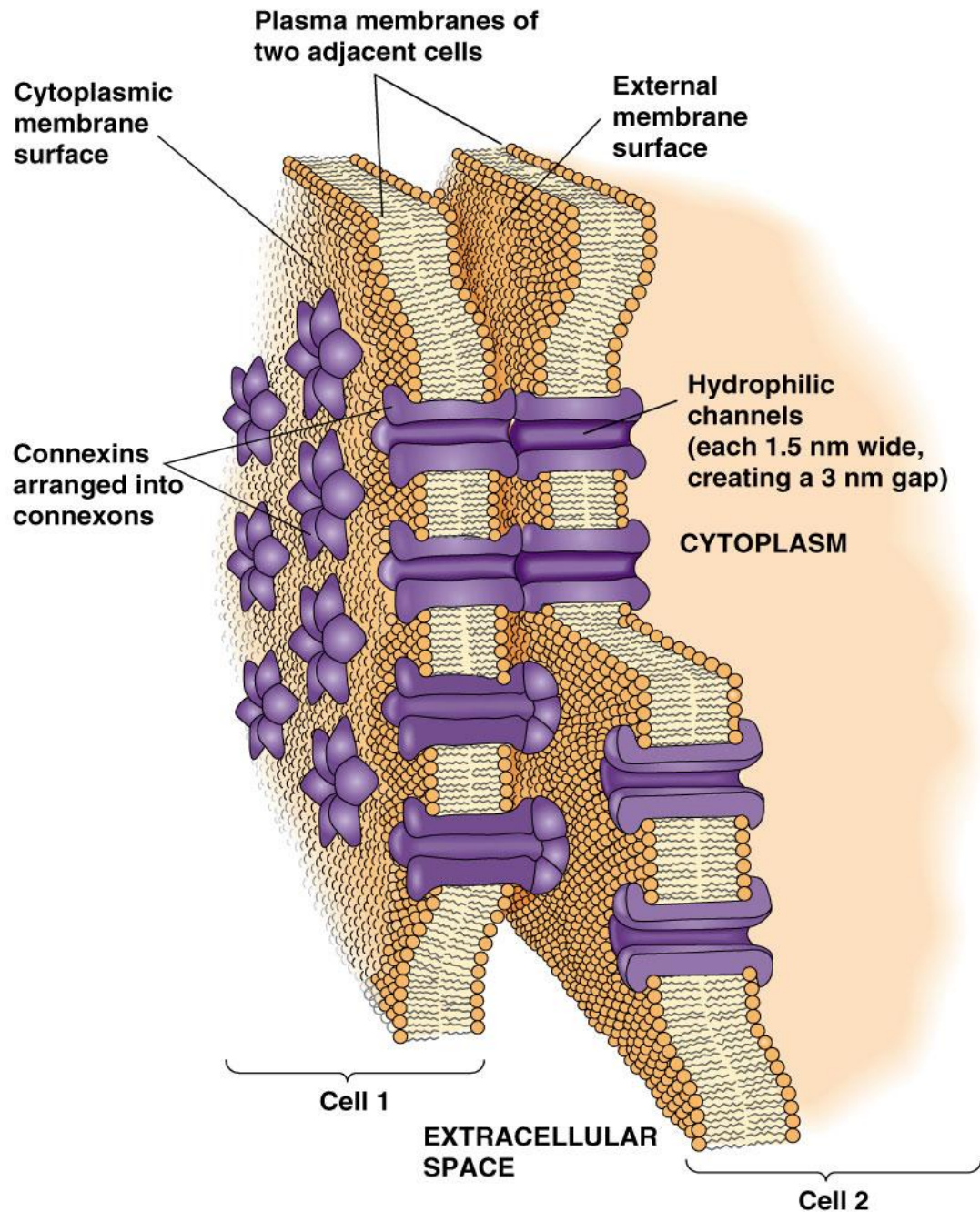
*Volvox* is differentiated to form gonidia



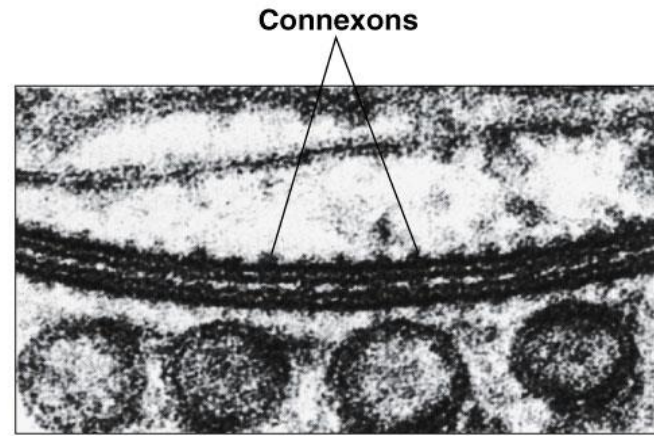
# Plasmodesmata





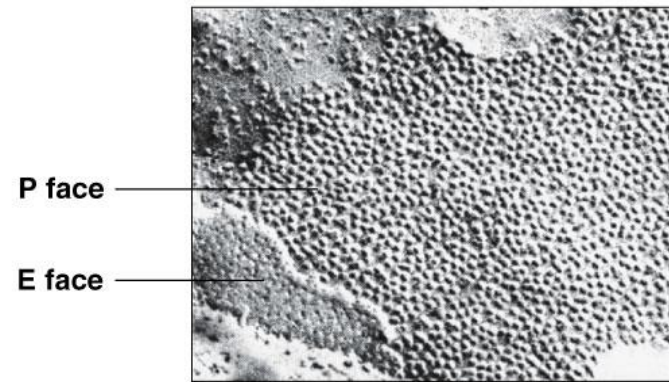


**(a) Gap junction diagram**



**(b) Electron micrograph of a gap junction**

0.1  $\mu\text{m}$



0.5  $\mu\text{m}$

**(c) Freeze-fracture of a gap junction**

# **CONTRIBUTIONS OF DISTINGUISHED EMBRYOLOGISTS**



# Professor Panchanan Maheswari

Professor P. Maheshwari who served as Professor and Head of the Department of Botany, University of Delhi from 1950 to 1966 built a flourishing school of embryology which became internationally recognized. He has contributed significantly to all areas of embryology through integrative approaches.

AFTER joining the Department of Botany, University of Delhi in 1950, Panchanan Maheshwari started developing a school of embryology of flowering plants which attained world status by the mid-1960s.

In his seminal book *An Introduction to the Embryology of Angiosperms*<sup>1</sup>, Maheshwari classified embryology into descriptive, phylogenetic and experimental aspects.

He defined experimental embryology as that branch 'concerned with the imitation and a modification of embryological processes with a view to understanding the physics and chemistry of various events so as to bring them under human control' .

Studies made in his lab are among the first detailed accounts on the structure of the stigma and style in several members of the Liliaceae and Amaryllidaceae.

The Liliaceae are characterized by hollow style and the Amaryllidaceae present much variation from typically hollow to partially hollow and totally solid conditions.

Based on these reports, Johri, proposed the evolution of the solid style from the hollow style in the Amaryllidaceae.

## Professor B M JOHRI

Professor B. M. Johri, was one of India's foremost botanists, whose contributions in embryology, plant morphology and morphogenesis are internationally known.

He has made seminal contribution in the area of microsporogenesis.



**Giovanni Battista Amici** (Italian: 25 March 1786 – 10 April 1863) was an [Italian astronomer](#), [microscopist](#), and botanist.

Amici was born in [Modena](#), in present-day [Italy](#). After studying at [Bologna](#), he became professor of [mathematics](#) at Modena,

He was chosen director of the [observatory](#) at [Florence](#).

His name is best known for the improvements he effected in the mirrors of [reflecting telescopes](#) and especially in the construction of the [microscope](#).

His [biological](#) studies of the circulation of the sap in plants, the fructification of plants etc. He was the first to observe the [pollen tube](#).

He invented the [dipleidoscope](#) and also the [direct vision prism](#).

The crater [Amici](#) on the [Moon](#) is named in his honour.

## W. Hofmeister

Hofmeister, a German scientist, is widely credited with discovery of [alternation of generations](#) as a general principle in plant life. His proposal that alternation between a spore-bearing generation ([sporophyte](#)) and a gamete-bearing generation ([gametophyte](#)) constituted a unifying theory of plant [evolution](#) that was published in 1851, eight years before [Darwin's \*On the Origin of Species\*](#).

After Darwin's book was published, Hofmeister became a leading proponent of [Darwinism](#).

## Eduard Strasburger

He was born in [Warsaw, Poland](#).

In 1869 he was appointed professor of [botany](#) at the [University of Jena](#). From 1881 he was head of the *Botanisches Institut* at the [University of Bonn](#).

Strasburger was a founder of the famous *Lehrbuch der Botanik für Hochschulen (Textbook of Botany)*, which first appeared in 1894. He was the first to provide an accurate description of the embryonic sac in [gymnosperms](#) (such as [conifers](#)) and [angiosperms](#) (flowering plants), along with demonstrating double-fertilization in angiosperms. He came up with one of the modern laws of plant [cytology](#): "New cell nuclei can only arise from the division of other nuclei." and originated the terms [cytoplasm](#) and [nucleoplasm](#).

Together with [Walther Flemming](#) and [Edouard van Beneden](#), he elucidated chromosome distribution during cell division.



S.G. Nawaschin

He was a Russian Scientist. The double fertilization in angiosperm is the centennial discovery by S.G. Nawaschin. Studies in the first 50 years mainly by light microscopy had defined this process of double fertilization as a general characteristic in angiosperms. In the later 50 years research works in this field have been greatly advanced on account of the developing new techniques especially the electron-microscopy.

W. A. Jensen

Worked on Botanical Histochemistry

He worked on the anatomy of sterile leaves of *Elaphoglossum discolor*. He has reported the main diagnostic characters and provided new systematic data for the plant group.

In addition, it locates the production and accumulation sites of bioactive compounds to determine possible adaptive strategies of these species in the Amazon rainforest environment.

Diagnostic structural features include stoma typology, central veins and margin forms, type of mesophyll, and the presence of sclerenchymatous sheaths in the cortex, among others. Among the bioactive compounds related to defense adaptation are phenolic compounds, which occur in a few species, and alkaloids and mucilage, which are exclusive to *E. laminarioides*.

**John "Jack" Heslop-Harrison** was a British soldier and botanist.

In 1970 he was formally offered the position of Director of the [Royal Botanic Gardens, Kew](#), a much-prized position. He spent about a year as "director-designate" without official duties or pay and spent much of this time researching for his position, meaning that by the time he was officially appointed he had a clear idea of the direction in which he wanted to take the Gardens. In 1974 he delivered the [Royal Society's Croonian Lecture](#), and his presentation was well received. He made large changes to the way the institute worked but clashed with the government, who funded the institute, and eventually resigned in 1976, the first Director to do so since the position was created in 1822.